Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Improving Public Safety Communications in the 800 MHz Band	)	
	)	
Consolidating the 900 MHz Industrial/Land Transportation and Business Pool Channels	)	WT Docket No. 02-55

COMMENTS OF QUALCOMM INCORPORATED

QUALCOMM Incorporated hereby submits these comments in response to the Commission's *Notice of Proposed Rulemaking*, WT Docket No. 02-55 (released March 15, 2002) ("*NPRM*"), in the matter of Improving Public Safety Communications in the 800 MHz Band and Consolidating the 900 MHz Industrial/Land Transportation and Business Pool Channels. QUALCOMM applauds the Commission for its leadership in initiating a process to explore in a timely manner options and alternatives to remedy the spectrum environment for public safety operations in the 800 MHz band. Recent events highlight the increasing demands and challenges that our public safety agencies face. Ensuring that these agencies are able to meet these challenges armed with advanced and effective communications capabilities is a chief priority for our industry and our nation.

In its efforts to establish a flexible regulatory framework to meet current and future public safety communications needs, the Commission set the goal of ensuring that the availability of sufficient spectrum to accommodate efficient, effective telecommunications facilities and services for public safety communications.[1] QUALCOMM supports this goal and the Commission's related spectrum management objectives of enhancing spectrum efficiency, promoting nationwide interoperability, and minimizing harmful interference.[2] Other relevant objectives the Commission has identified for public safety communications include: avoiding undue delay in equipment development, supporting future communications technologies, promoting a competitive equipment market, providing flexibility to public safety organizations to meet local needs, and enabling the provision of voice, data, images and video.[3]

In the early 1970's, when the Commission adopted rules for the use of the 800 MHz band for land mobile operations, including private land mobile radio systems and public safety radio services, "the technology available at that time did not readily accommodate the use of contiguous spectrum at a single base station site."[4] Therefore, rather than make contiguous spectrum available to each radio service, it made channel pairs made available that were "interleaved" between channels allotted to the other radio services.

Since that time, wireless communications technology has been significantly enhanced. Through the use of innovative and spectrally efficient technologies, today's wireless communications networks are capable of providing a wide range of robust, high-quality voice and data services, with minimal interference amongst adjacent licensees. The availability of these new technologies, along with a restructuring of the 800 MHz public safety allocation, will offer public safety agencies significantly greater opportunities to meet their advanced wireless communications requirements, while avoiding the historical difficulties associated with the 800 MHz allocation scheme.

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[1] The Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010, Establishment of Rules and Requirements for Priority Access Service, *First Report and Order and Third Notice of Proposed Rulemaking*, WT Docket No. 96-86 (August 6, 1998) (para.1).

[2] *Id*.

[3] *Id*. (para. 10).

[4] *NPRM*. (para. 7).

QUALCOMM is a leader in the development of Code Division Multiple Access ("CDMA") technology, which has been licensed to over 95 leading communications manufacturers worldwide, and due to its unsurpassed voice quality, system capacity, privacy and flexibility, has been recognized as the global standard for next-generation, digital wireless communications products and services. With this experience, QUALCOMM's comments in this proceeding will focus on providing the Commission and the public safety community with data on: a) the benefits to public safety of reallocating the 800 MHz band; b) the capabilities of CDMA technology to meet public safety requirements for a wide variety of voice and data services; and c) the steps that the Commission can take to facilitate the introduction of advanced communications capabilities for public safety.

A. Benefits of Reallocating the 800 MHz Band

In its *NPRM*, the Commission identifies the myriad difficulties experienced by public safety agencies in operating their existing wireless communications networks given the increasing incidents of interference with SMR/CMRS systems that are operating in adjacent frequency bands. This interference persists despite numerous attempts by all parties involved to identify the causes and mitigate the harm caused to the public safety systems. One of the primary causes of this interference is the combination of the interleaved channelization of the 800 MHz band and the incompatibility between the public safety and the SMR/CMRS network architectures.

SMR/CMRS networks are generally built on a cellular model, and operate in an interference-limited mode. In most well-engineered SMR/CMRS networks, when a mobile terminal is in a situation where it might experience adjacent channel interference from another cell site, it should have high enough signal level from its serving cell so that it can close the link with the serving cell site. In such networks, the effective noise floor tends to be well above the thermal noise floor, due to some RF splatter into adjacent and nearby channels, as well as co-channel emissions in nearby parts of the network. In dense and busy networks using technologies with weak or no power control, this can result in interference floors 10 dB, 20 dB, or more above the thermal noise floor. This tends to limit coverage in the cellular system, and also cause a general deterioration in service quality. As the Commission noted in its *NPRM*, in

order to improve coverage, service quality, and "to increase capacity in response to subscriber demand, the [cellular] system operators must often build additional base stations."[5]

Public safety networks, on the other hand, which traditionally use a single base station with a high antenna, or peer-to-peer two-way radios, are operated in noise-limited mode. When a mobile terminal in such a network gets near the edge of coverage, it is operating near to receiver sensitivity levels, so that any additional interference in the network due to competing services will have a dramatic impact on service quality, causing decreased coverage and reduced service quality. If there are interleaved channels that are in use by adjacent public safety and SMR/CMRS networks, the result will be substantially reduced coverage and impaired service quality for the users of the public safety system. In addition, as the Commission noted in its *NPRM*, current "public safety receivers are often not sufficiently selective to reject undesired signals that may be present under these conditions."[6] A move to separate, contiguous allocations for public safety and SMR/CMRS will greatly reduce this interference.

In addition to reducing the amount of interference between public safety and SMR/CMRS systems, a separate and contiguous allocation affords public safety the opportunity to consider the benefits of using advanced technologies that have been developed for use in commercial wireless systems. Since the early 1980s, commercial wireless systems using cellular technologies have grown dramatically with nearly 135 million cellular subscribers in the United States and millions more worldwide. Most of these cellular systems are operating in contiguous frequency allocations of 2 x 5 MHz or more, which enables the licensees to configure their systems to meet increasing traffic demands. In addition to responding to growing demand for basic mobile voice service, cellular technologies support the use of low-power mobile terminals, which are much smaller and have longer battery life than terminals using other types of technologies. And, today, with the latest advances in data throughput, cellular technologies support both high-quality, high-capacity voice services, as well as a wide range of high-speed data services. With a contiguous spectrum allocation, public safety agencies would have the opportunity to take advantage of the significant advances in cellular technology, and thereby meet their critical communications requirements.

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[5] *Id.* (para. 12).

[6] *Id*. (para. 15).

The Commission acknowledged in its *NPRM* that public safety systems could be designed to use cellular-type architectures "i.e. employing multiple low power base stations, automated handoff and frequency re-use."[7] However, the Commission also stated, "the infrastructure required would be more complex and costly in terms of construction, maintenance and leasing of towers."[8] While a move to cellular-architecture will require the installation and maintenance of more base stations than currently used by a public safety agencies, the benefits of moving to a cellular-architecture, as described above, are numerous and will likely outweigh the expenses associated with additional base stations.

For example, by using systems based on a cellular-architecture, public safety agencies will have immediate, ongoing access to the latest advances in technology, including new voice, data, image and video applications. They will also benefit from a highly competitive marketplace with multiple equipment suppliers, as well as from increased interoperability. In fact, recognizing the benefits of commercial technologies, several public safety agencies already rely on commercial cellular networks to supplement their dedicated networks. Therefore, allowing public safety agencies to have access to contiguous frequency bands, and permitting them to move to a cellular-architecture will achieve many of the Commission's goals for public safety.

Moreover, the Commission noted that cellular-type system operators "make intensive, and therefore efficient, use of their assigned frequencies," which is not currently the case for public safety systems that require significantly more spectrum to provide basic voice and data services than their cellular counterparts.[9] One of the Commission's primary goals for public safety ensuring the "availability of sufficient spectrum to accommodate efficient, effective telecommunications facilities and services." Enabling public safety agencies to take advantage of the numerous benefits of cellular technologies, including their increased spectral efficiency, would help the Commission to achieve this additional important spectrum management objective.

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[7] *Id.* (para. 11).

[8] *Id*.

[9] *Id*. (para 12).

B. Meeting Public Safety Requirements with CDMA

As one example of the benefits of permitting public safety to move to a cellular-architecture in contiguous spectrum allocations, QUALCOMM would like to present the Commission and the public safety community with information regarding CDMA-based solutions for public safety operations. QUALCOMM is the primary developer of Code Division Multiple Access (CDMA) technology, which is used in over 70 countries by more than 100 million subscribers around the world.

CDMA solutions are available for a number of communications applications, including mobile cellular, fixed wireless and satellite communications. The International Telecommunication Union (ITU) has selected CDMA as the global standard for IMT-2000 systems. In particular, the CDMA2000 family of next generation wireless standards provides a wide range of mobile voice and high-speed data services in a 1.25 MHz carrier, and is considered the most spectrally efficient wireless technology available today. As an open and flexible platform, CDMA2000 is capable of providing a wide variety of specialized services that can meet the evolving needs of both public safety users and wireless consumers, including:

- High-capacity voice services
- High-speed data (with data rates ranging from 153 kbps to 2.4 Mbps)
- GPS-assisted position location capability
- Push-to-talk/group call functionality
- Voice and data encryption services (Type 1 to Type 4) (using over-the-air-rekey)
- Instant group messaging
- Wireless device application development support (via an application program interface)
- Over-the-air deployment of new customized applications/services
- Flexible network planning.

Over the past several years, QUALCOMM has worked to tailor the CDMA platform to provide a number of specialized services that can be used to meet many public safety communications requirements. One such specialized service is a push-to-talk or dispatch capability, which has been developed for CDMA2000 using standard voice-over-IP (VoIP) protocols, such as Session Initiation Protocol (SIP) and Real-time Transport Protocol (RTP). It

operates as an adjunct to the CDMA2000 infrastructure and uses the packet data service options and other advanced standard CDMA2000 features to provide dispatch services to support one-to-one (two users only) and one-to-many (three or more users) half duplex communications. This will be implemented by means of a software application running on a separate platform connected to the CDMA network, thus providing a highly flexible environment for service and application creation.

In addition, in response to U.S. Department of Defense requirements, QUALCOMM has developed secure CDMA voice and data services, with Type 1 through Type 4 encryption capabilities, which can be applied to meet public safety requirements, including group call and group messaging. CDMA handsets that have been enhanced with these security capabilities currently operate on commercial networks. By deploying systems using cellular-architecture technologies and/or working with commercial cellular service providers, public safety agencies can realize secure call capability as well as interoperability with the highest-level communication security standards set by the U.S. Government.

Other specialized capabilities that are available with CDMA equipment and can be used to meet public safety communications requirements include position location services and portable base station equipment. At times, especially during a catastrophe, public safety agencies encounter situations where installed communications infrastructure equipment (whether operated by public safety agencies or commercial service providers) is unavailable. Access to portable base station equipment using standard-issue technologies would enable the responding public safety users to mobilize and reinitiate communications rapidly. Moreover, there are myriad position location services that could be useful to public safety agencies in their operations, including surveillance and locating public safety units in panic/man down situations.

While CDMA is primarily known as a commercial wireless technology, its ability to support a wide variety of standard VoIP protocols, which can be used to develop push-to-talk, group call capabilities, and encrypted voice and data services, also make it well suited for the provision of public safety services. By taking advantage of technologies, such as CDMA2000, that have been developed for commercial cellular systems and for the U.S. Department of Defense, public safety agencies stand to benefit greatly from the global economies of scale that already exist for these systems and from the extensive technical knowledge base that has been developed in the deployment of these technologies.

C. Facilitating the Introduction of Advanced Communications Capabilities for Public Safety

As discussed above, when the Commission originally allocated the 800 MHz band for public safety operations, the technology available at the time did not readily accommodate the use of contiguous spectrum at a single base station site. Therefore, the Commission made channel pairs available that were "interleaved" between channels allotted to the other radio services. These channel pairs of 25 kHz each (and subsequently 12.5 kHz) are currently referred to as "narrowband" public safety channels to distinguish them from the "wideband" channels that the Commission has recently allocated for public safety in the 700 MHz band and the "broadband" channels in the 4.9 GHz band.

While the interleaved spectrum allocation in the 800 MHz band has necessitated the consideration of narrowband technologies for public safety that can operate within a 25 kHz channel, a reallocation of the band that results in larger contiguous blocks would enable the Commission to reconsider its conventional channelization scheme. With a more flexible approach that does not specify channel bandwidths, the Commission would be able to provide public safety agencies with operational flexibility and facilitate the use of newer, more efficient, and advanced technologies that can meet both current and future public safety requirements.

D. Conclusion

QUALCOMM once again applauds the Commission for its leadership in initiating this proceeding to explore alternatives to remedy the spectrum environment for public safety operations in the 800 MHz band. A reallocation of the 800 MHz band that results in separate and contiguous bands for public safety and SMR/CMRS will significantly reduce interference problems between the services. It will also enable the Commission to explore new ways to facilitate the introduction of advanced communications capabilities for public safety, including the use of advanced cellular technologies.

Respectfully submitted,

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